

What is claimed is:

1. A reflection-type optical sensor for detecting an object, the sensor comprising:

5 a light-emitting element having a central axis extending in a predetermined direction that extends substantially normal to a surface of an object to be detected and having a light-emitting portion that emits a detecting light onto the surface of the object, the detecting light traveling toward the surface of the object to define an irradiated region on the object;

10 a light-receiving element having a central axis extending parallel with the central axis of the light-emitting element and having a light-receiving portion that receives a reflected light that has reflected off a reflecting region on the object, the reflecting region and the irradiated region overlapping at an overlapping region on the surface of the object; and

15 a restricting member having a restricting portion defining an opening that allows a part of the detecting light and a part of the reflected light to pass therethrough, the restricting portion restricting a size of the opening to reduce an area of the overlapping region on the surface of the object.

20 2. A reflection-type optical sensor according to Claim 1, wherein the light-emitting element has a light-emitting

end that confronts the object and that is located on the central axis of the light-emitting element, the light-emitting portion being located on the light-emitting end and having a predetermined directivity that defines the irradiated region on the object; and

wherein the light-receiving element has a light-receiving end that confronts the object and that is located on the central axis of the light-receiving element, the light-receiving portion being located on the light-receiving end and having another predetermined directivity that defines the reflecting region on the object.

3. A reflection-type optical sensor according to Claim 1, wherein the light-emitting element emits the detecting light at an emission angle toward the irradiated region on the surface of the object,

the light-receiving element receives the reflected light at a light-receiving angle from the reflecting region on the surface of the object, and

the restricting portion decreases the amounts of both of the emission angle and the light-receiving angle.

4. A reflection-type optical sensor according to Claim 1, wherein the restricting member includes a wall portion that is located between the object and the light-emitting portion and the light-receiving portion.

5. A reflection-type optical sensor according to Claim

1, wherein the restricting member includes a cap member, the light-emitting element and the light-receiving element being mounted inside the cap member, the cap member having a wall portion that is located between the object and the light-emitting portion and the light-receiving portion, the wall portion being formed with at least one opening for allowing passage of the part of the detecting light and the part of the reflected light.

6. A reflection-type optical sensor according to Claim 4, wherein the light-emitting element and the light-receiving element are disposed, with a distance from the light-emitting portion to the wall portion being approximately equal to a distance from the light-receiving portion to the wall portion.

7. A reflection-type optical sensor according to Claim 4, wherein the wall portion is formed with a single opening for allowing the passage of both of the part of the detecting light and the reflected light; and

the center of the single opening is positioned on a line that extends substantially normal to the surface of the object from an approximate center of a line segment that connects the light-emitting portion to the light-receiving portion.

8. A reflection-type optical sensor according to Claim 7, wherein the single opening is circular in shape.

9. A reflection-type optical sensor according to Claim 8, wherein the light-emitting element and the light-receiving element are each substantially of a cylindrical shape extending along a corresponding central axis; outer diameters of the light-emitting element and the light-receiving element are each within a range of 2.0 to 2.4 mm; a distance between the light-emitting portion and the light-receiving portion is 2.8 mm; distances from the light-emitting portion to the wall portion and from the light-receiving portion to the wall portion are each 5.0 mm; and the single opening has an inner diameter of 2.5-3.5 mm.

10. A reflection-type optical sensor according to Claim 4, wherein the wall portion is formed with a plurality of openings, the plurality of openings including one emission opening for allowing passage of the part of the detecting light and a reception opening for allowing passage of the part of the reflected light;

the center of the emission opening is positioned on a line that is substantially normal to the surface of the object and that extends from one point in a first line segment, the first line segment being defined between the light-emitting portion and a center point of a second line segment connecting the light-emitting portion and the light-receiving portion, and

the center of the reception opening is positioned on

another line that is substantially normal to the surface of the object and that extends from a point in a third line segment, the third line segment being defined between the light-receiving portion and the center point of the second line segment.

11. A carriage for moving over an object and for detecting the object, the carriage comprising:

a moving member that moves over the object; and

a detecting unit that is provided on the moving member and that detects the object to determine a position of the object, the detecting unit including a reflection-type optical sensor, the reflection-type optical sensor including:

a light-emitting element having a central axis extending in a predetermined direction that extends substantially normal to a surface of the object to be detected and having a light-emitting portion that emits a detecting light onto the surface of the object, the detecting light traveling toward the surface of the object to define an irradiated region on the object;

a light-receiving element having a central axis extending parallel with the central axis of the light-emitting element and having a light-receiving portion that receives a reflected light that has reflected off a reflecting region on the object, the reflecting region and

the irradiated region overlapping at an overlapping region on the surface of the object; and

5 a restricting member having a restricting portion defining an opening that allows a part of the detecting light and a part of the reflected light to pass therethrough, the restricting portion restricting a size of the opening to reduce an area of the overlapping region on the surface of the object.

12. A data processing device, comprising:

10 a moving member that moves over an object;

a detecting unit that moves together with the moving member and that detects the object, the detecting unit including a reflection-type optical sensor for detecting an edge of the object, the reflection-type optical sensor including:

15 a light-emitting element having a central axis extending in a predetermined direction that extends substantially normal to a surface of the object to be detected and having a light-emitting portion that emits a detecting light onto the surface of the object, the detecting light traveling toward the surface of the object to define an irradiated region on the object;

20 a light-receiving element having a central axis extending parallel with the central axis of the light-emitting element and having a light-receiving portion that

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receives a reflected light that has reflected off a reflecting region on the object, the reflecting region and the irradiated region overlapping at an overlapping region on the surface of the object; and

5           a restricting member having a restricting portion defining an opening that allows a part of the detecting light and a part of the reflected light to pass therethrough, the restricting portion restricting a size of the opening to reduce an area of the overlapping region on  
10       the surface of the object;

          a movement control unit controlling the moving member to move reciprocally;

          an object moving unit moving the object in a direction different from the direction, in which the movement control  
15       unit controls the moving member to move; and

          a process executing unit that is moved together with the moving member and that performs, based on detection results obtained by the detecting unit, a data control process including at least one of a data adding process for  
20       adding data to the object and a data acquiring process for acquiring data from the object.

13. A data processing device according to Claim 12, wherein the restricting member includes a wall portion that is located between the object and the light-emitting portion  
25       and the light-receiving portion.

14. A data processing device according to Claim 12,  
wherein the restricting member includes a cap member that  
encloses therein the light-emitting element and the light-  
receiving element and that has a wall portion, the wall  
5 portion confronting the object and being located between the  
object and the light-emitting portion and the light-  
receiving portion, the wall portion being formed with at  
least one opening for allowing passage of the part of the  
detecting light and the part of the reflected light.

10 15. A data processing device according to Claim 12,  
wherein the object is a recording medium; and

wherein the process executing unit includes a print  
unit that prints various data on the recording medium.

16. A data processing device according to Claim 12,  
15 wherein a distance from the opening to the object is  
substantially equal to both of a distance from the light-  
emitting portion to the wall portion and a distance from the  
light-receiving portion to the wall portion.

17. A data processing device according to Claim 12,  
20 wherein the detecting unit detects a leading edge of the  
object defined in a direction parallel to an object moving  
direction in which the object moving unit moves the object  
and edges of the object defined in another direction  
perpendicular to the direction in which the object moving  
25 unit moves the object.

18. A data processing device according to Claim 12,  
wherein the detecting unit detects an edge of the object  
defined in a moving-member moving direction in which the  
moving member moves; and

5       the light-emitting element and the light-receiving  
element are aligned with the moving-member moving direction.

19. A data processing device according to Claim 12,  
wherein the detecting unit detects an edge of the object  
defined in a direction perpendicular to a moving-member  
moving direction in which the moving member moves; and

10       the light-emitting element and the light-receiving  
element are aligned with the direction perpendicular to the  
moving-member moving direction.

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